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# TWO-DIMENSIONAL MODULATION ENCODING FOR HIGH DENSITY OPTICAL STORAGE

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The present invention relates to an encoding apparatus for two-dimensionally encoding user data of a user data stream into channel data stream along a two-dimensional channel strip of at least two bit rows one dimensionally evolving along a first direction and being aligned with each other along a second direction, said two directions constituting a

5   two-dimensional lattice of bit positions. The present invention relates further to a corresponding encoding method and a computer program for implementing said method on a computer.

In one-dimensional recording on optical discs the channel bits of the channel data stream are recorded along a spiral track, the spiral being one bit wide. For two-

10   dimensional recording the channel bits of a channel data stream can also be recorded along a spiral, albeit a broad spiral, that consists of a number of bit rows which are aligned with respect to each other in the radial direction, that is, in the direction orthogonal to the spiral direction.

European patent application 01203878.2 (ID 607133) discloses a method and

15   system for multi-dimensionally coding and/or decoding an information to/from a lattice structure representing channel bit positions of said coded information in at least two dimensions. Encoding and/or decoding is performed by using a quasi close-packed lattice structure. For the case of two-dimensional encoding and/or decoding, preferably a quasi-hexagonal lattice structure is to be used.

20   Further, European patent application 02076665.5 (PHNL 020368) discloses a method of multi-dimensionally encoding a user data stream of user words into a channel data stream of channel words evolving in a one-dimensional direction of infinite extent. Further, a corresponding method of decoding is disclosed. The code disclosed in European patent application 02076665.5 (PHNL 020368) is based on a finite-state machine. In order to

25   implement certain two- or multi-dimensional coding constraints and coding geometries which lead to higher storage densities and improve the coding efficiency, the method of encoding according to the finite-state machine encoder, comprises the following steps:
a user word is encoded into an NRZ channel word by selecting said NRZ channel word from a code table depending on said user word and the current state of the